HP 4396A Network/Spectrum Analyzer
Performance Test Program (PN: 04396-65001)

Operation Manual

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Notice

The information contained in this document is subject to change without notice.

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General Information

Introduction

The HP 4396A Performance Test Program (P/N: 04396-65001) is written in HP BASIC, designed to minimize the test time, and helps eliminate human error while performance testing the HP 4396A Network/Spectrum Analyzer. When executing the program, the computer displays the test instructions, and controls the HP 4396A under test and the related test equipment.

This performance test program has the "Built-in Calibration Data Editor" which edits and stores the standards' calibration data needed in the tests.

Initial Inspection

The Performance Test Program for HP 4396A has been carefully inspected before being shipped from the factory. Verify that the shipping container contains the following:

- 2 ea. of 3-1/2 inch diskettes
- Operation Manual (this book)

The diskettes should contain the following. Check the contents of the diskette using your computer `CAT` command:

Filename	Description
`TEST4396A`	Main Program
`SUBT4396A`	Subprogram
`CSUBS`	Compiled Utilities for BASIC 5.13
`CSUBS6`	Compiled Utilities for BASIC 6.2 and above
`TE_T4396A`	Test Equipment Configuration Program

Making Working Copies

Copy the contents of the performance test program diskette to a working diskette or to the hard disk to prevent accidental deletion or destruction of the program files. Use the working diskettes or the hard disk, and store the original diskette in a safe place.

Note Make an exclusive directory for this program and copy the files of the diskette into the directory when you use a hard disk.

Required Tools

Hardware Requirements

Table 1-1 lists the equipment required for executing the programs.

Table 1-1. Required Equipment

Equipment	Requirements	Recommended Models	Qty.
Computer	No Substitute	HP 9000 series 200 or 300[1] RAM $\geq$ 4 MBytes	1
Operating System	BASIC 5.1 or higher	HP 98616A	1
Flexible Disk Drive	Dual 3-1/2 inch Drive	HP 9122C	1
Printer	HP-IB Printer	HP 2225AJ	1

1 Excluding the HP 9826A

Software Requirements

Table 1-2 lists the required language extensions to be used with the performance test program. If you already have a pre-configured BASIC system, you can verify if it contains all the required binaries by typing `LIST BIN`.

Table 1-2. Required Language Extensions

Name	Description	Name	Description
CLOCK	Clock	CRTX	CRT Extensions
EDIT	List and Edit	FHPIB	Fast Disc Interface Driver
GRAPHX	Graphics Extensions	IO	I/O
MAT	Matrix Statements	PDEV	Program Development
CRTA	Alpha CRT Driver	CS80	CS80 Disc Driver
ERR	Error Messages	GRAPH	Graphics
HPIB	HPIB Interface Driver	KBD	Keyboard Extensions
MS	Mass Storage		

Test Equipment

Table 1-3 lists the required equipment to perform the performance test.

Table 1-3. Recommended Test Equipment

Equipment Name	Model or HP Part Number	Qty
Frequency Counter	HP 5343A Opt. 001 or HP 5334B Opt.010 or HP 5335A Opt.010[1]	1
Frequency Standard[2]	HP 5061B	1
Spectrum Analyzer	HP 8566A/B	1
Network Analyzer	HP 8753A/B/C	1
Power Meter	HP 436A Opt. 022 or HP 437B or HP 438A	1
Power Sensor	HP 8482A	1
Power Sensor	HP 8481D	1
Function Genarator	HP 3325A	1
Signal Generator[3]	HP 8663A or HP 8642B	2
Step Attenuator[4]	HP 8496A/G Option 001 and H60[5]	1
Step Attenuator[4]	HP 8494A/G Option 001 and H60[6]	1
Attenuator/Switch Driver	HP 11713A[7]	1
50Ω Type-N Calibration Kit	HP 85032B	1
T/R Test Set	HP 85044A	1
50 MHz Low Pass Filter	PN 0955-0306	1
50Ω termination, type-N(m)	HP 909C Opt 012 or part of HP 85032B[8]	3
6 dB Fixed Attenuation, 50 Ω	HP 8491A Opt 006	2
6 dB Fixed Attenuation, 50 Ω, VSWR $\leq$ 1.015	HP 8491A Opt 006 & Opt H60[9]	2
Two-way Power Splitter	HP 11667A	1
N(m)-N(m) cable, 50 Ω	HP 11500B or part of HP 11851B[10]	4
RF cable kit	HP 11851B	1

1 Option 001 or 010 (optional time base) is not required, when a frequency standard in Table 1-3 is available.

2 Required for testing an analyzer equipped with Option 1D5 (High Stability Frequency Reference).

3 The "HPxxxx_2" type model number is assigned to the "Signal Generator 2", while the nomal "HPxxxx" is used for the "Signal Generator 1". This makes us possible to use two signal generators of the same model.

4 Calibration values at 50 MHz are required in the tests. See the *Calibration Data Required for Step Attenuators* later in this chapter.

5 An HP 8496A/G step attenuator with required low VSWR ($\leq$ 1.02) can be purchased by specifying option H60.

6 An HP 8494A/G step attenuator with required low VSWR ($\leq$ 1.02) can be purchased by specifying option H60.

7 Required when an HP 8494G or HP 8496G step attenuator is used in the tests.

8 The HP 85032B includes a type-N(m) 50 Ω termination.

9 An HP 8491A Opt. 006 fixed attenuator with required low VSWR ($\leq$ 1.015) can be purchased by specifying Opt. H60.

10 The HP 11851B includes three N(m)-N(m) cables of 61 cm and a N(m)-N(m) cable of 88 cm.

Table 1-3. Recommended Test Equipment (continued)

Equipment Name	Model or HP Part Number	Qty
BNC(m)-BNC(m) cable, 61 cm, 50 Ω	PN 8120-1839	1
BNC(m)-BNC(m) cable, 122 cm, 50 Ω	PN 8120-1840	2
BNC(f)-BNC(f) adapter, 50 Ω	PN 1250-0080	1
BNC(f)-SMA(f) adapter, 50 Ω	PN 1250-0562	1
Tee BNC(m)-(f)-(f) adapter, 50 Ω	PN 1250-0781	1
N(m)-N(m) adapter, 50 Ω	PN 1250-1475	1
N(m)-BNC(f) adapter, 50 Ω	PN 1250-1476	1
N(f)-BNC(m) adapter, 50 Ω	PN 1250-1477	1
APC 3.5(m)-APC 3.5(f) adapter, 50 Ω	PN 1250-1866	1
APC 7-N(f) adapter, 50 Ω	HP 11524A or part of HP 85032B[1]	1

1 The HP 85032B includes two APC 7-N(f) adapters.

Calibration Data Required for Step Attenuator

The six performance tests listed below measure the analyzer's performance against a known standard (the attenuation values at a frequency 50 MHz of the HP 8496A/G and HP 8494A/G step attenuators).

3. Non-Sweep Power Linearity Test
4. Power Sweep Linearity Test
10. Magnitude Ratio/Phase Dynamic Accuracy Test
14. Amplitude Fidelity Test
15. Input Attenuator Switching Uncertainty Test
18. IF Gain Switching Uncertainty Test

These tests require the calibrated values of the attenuators listed in Table 1-4 and Table 1-5. Enter these attenuation values (referenced to 0 dB setting) at the beginning of the program with following instructions. See "Built-in Calibration Data Editor" in Chapter 3 for details.

Table 1-4. Calibration Data Required for HP 8496A/G

Frequency	Attenuation	Uncertainty
50 MHz	10 dB	≤ 0.0060 dB
	20 dB	≤ 0.0060 dB
	30 dB	≤ 0.0066 dB
	40 dB	≤ 0.0090 dB
	50 dB	≤ 0.0165 dB
	60 dB	≤ 0.0197 dB
	70 dB	≤ 0.0272 dB

Table 1-5. Calibration Data Required for HP 8494A/G

Frequency	Attenuation	Uncertainty
50 MHz	2 dB	≤ 0.007 dB
	4 dB	≤ 0.007 dB
	6 dB	≤ 0.007 dB
	8 dB	≤ 0.007 dB
	10 dB	≤ 0.007 dB

The calibration uncertainty is the primary source of measurement error in performance tests. The measurement uncertainties listed in the performance test record are valid only when the uncertainty of the step attenuation data satisfies that given in the third column of Table 1-4 and Table 1-5.

The calibration of step attenuators, HP 8496A/G and HP 8494A/G, are available at Hewlett-Packard. For information about the calibration and the available uncertainties, contact your nearest Hewlett-Packard service center.

HP HP 4396A
Network/Spectrum Analyzer

Performance Test Manual

MANUAL IDENTIFICATION

Model Number: HP 4396A
Date Printed: Dec. 1992
Part Number: 04396-90100

This supplement contains information for correcting manual errors and for adapting the manual to newer instruments that contains improvements or modifications not documented in the existing manual.

To use this supplement
1. Make all ERRATA corrections
2. Make all appropriate serial-number-related changes listed below

SERIAL PREFIX OR NUMBER	MAKE MANUAL CHANGES

SERIAL PREFIX OR NUMBER	MAKE MANUAL CHANGES

▸ New Item

ERRATA

Paste the attached replacement pages on the following pages in the Performance Test Manual.

Page 2-22: Original to Rev:6/93
Page 2-54: Original to Rev:6/93
Page 2-55: Original to Rev:6/93
Page 2-57: Original to Rev:6/93
Page 2-61: Original to Rev:6/93
Page 2-62: Original to Rev:6/93
Page 2-84: Original to Rev:6/93
Page 2-86: Original to Rev:6/93
Page 4-8: Original to Rev:6/93
Page 4-11: Original to Rev:6/93
Page 4-14: Original to Rev:6/93
Page 4-15: Original to Rev:6/93
Page 4-16: Original to Rev:6/93
Page 4-17: Original to Rev:6/93

NOTE
Manual change supplement are revised as often as necessary to keep manuals as current and accurate as possible. Hewlett-Packard recommends that you periodically request the latest edition of this supplement. Free copies are available from all HP offices. When requesting copies, quote the manual identification information from your supplement, or the model number and print date from the title page of the manual.

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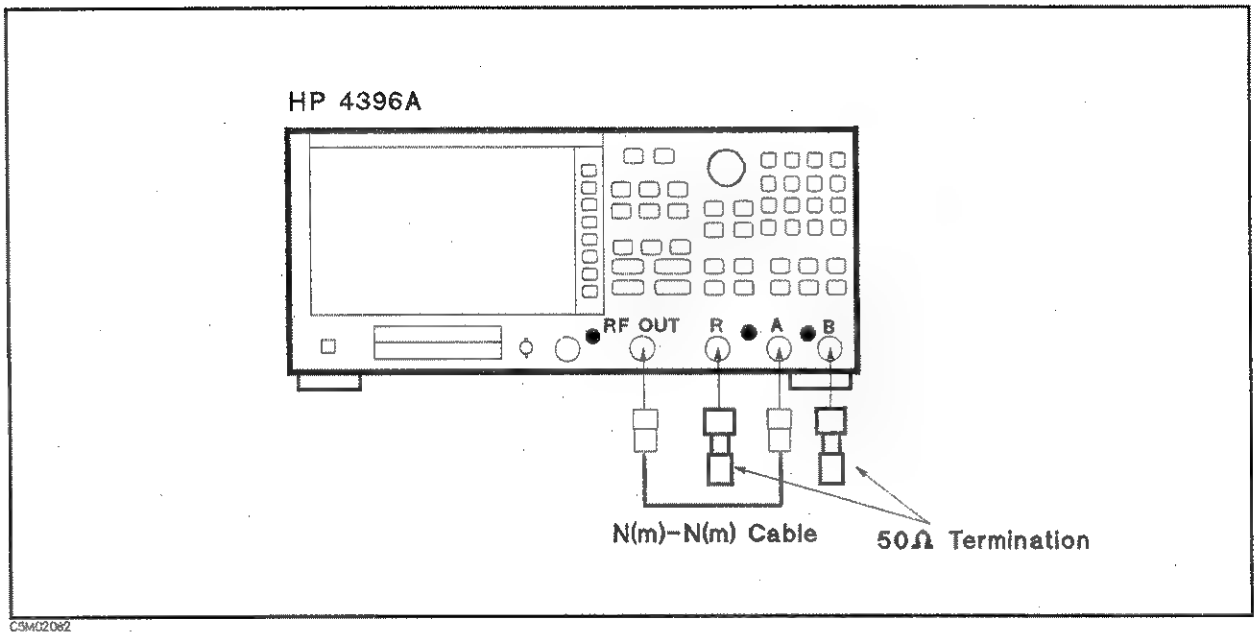

Figure 2-8. Input Crosstalk Test Setup 2

c. Change the HP 4396A controls as follows:

Control Settings	Key Strokes
Active Channel: CH 1 Input: A	(Ch 1) (Meas), A
Active Channel: CH 2 Input: A	(Ch 2) (Meas), A
IF BW: 1 kHz	(Bw/Avg), IF BW, (1), (k/m)

d. Press (Trigger), SINGLE to make a sweep. Wait for the completion of the sweep.

e. Set the HP 4396A controls as follows:

Control Settings	Key Strokes
Active Channel: CH 1 Data→Memory	(Ch 1) (Display), DATA→MEMORY (A beep indicates that the trace is stored.)
Data Math: DATA–MEM Reference Value: –100 dB	(Display), DATA MATH [DATA], DATA–MEM (Scale Ref), REFERENCE VALUE, (-), (1), (0), (0), (x1)
Input: R	(Meas), R
Active Channel: CH 2 Data→Memory	(Ch 2) (Display), DATA→MEMORY (A beep indicates that the trace is stored.)
Data Math: DATA–MEM Reference Value: –100 dB	(Display), DATA MATH [DATA], DATA–MEM (Scale Ref), REFERENCE VALUE, (-), (1), (0), (0), (x1)

6. Set the step attenuator to 0 dB.
7. On the HP 4396A, press (Search), MAX to move the marker to the peak of the carrier.
8. On the signal generator, adjust the amplitude until the HP 4396A marker reads −10 dB ±0.1 dB.
9. On the HP 4396A, press (Trigger), SINGLE to make a sweep. Wait for the completion of the sweep.
10. Press (Search), MAX, (Marker), ΔMODE MENU, FIXED ΔMKR to place the delta reference marker on the peak of the carrier (reference level of the amplitude fidelity).
11. Set the step attenuator to the first setting 10 dB in the second column of Table 2-14.

Table 2-14. Amplitude Fidelity Test Settings 1

dB from Reference Level	Step Attenuator
−10 dB	10 dB
−20 dB	20 dB
−30 dB	30 dB
−40 dB	40 dB
−50 dB	50 dB
−60 dB	60 dB

12. Perform the following steps to measure the amplitude fidelity.
    a. Press (Trigger), SINGLE to make a sweep. Wait for the completion of the sweep.
    b. Press (Search), MAX.
    c. Record the delta marker reading in the calculation sheet for the amplitude fidelity at an RBW of 10 kHz. Use the "HP 4396A Reading" column corresponding to the dB from the reference level in the first column of Table 2-14.
13. Change the step attenuator setting in accordance with the second column of Table 2-14. Then perform step 12 for each setting.
14. Set the HP 4396A controls as follows to measure the amplitude fidelity at RBW 1 MHz.

Control Settings	Key Strokes
Frequency Span: 50 MHz	(Span), (5), (0), (M/μ)
RBW: 1 MHz	(Bw/Avg), RES BW, (1), (M/μ)
VBW: 30 kHz	(Bw/Avg), VIDEO BW, (3), (0), (k/m)
Trigger: CONTINUOUS	(Trigger), CONTINUOUS

15. Set the step attenuator to 0 dB.
16. On the HP 4396A, press (Marker), ΔMODE MENU, ΔMODE OFF, (Search), MAX to move the marker to the peak of the carrier.
17. On the signal generator, adjust the amplitude until the HP 4396A marker reads −10 dB ±0.1 dB.
18. On the HP 4396A, press (Trigger), SINGLE to make a sweep. Wait for the completion of the sweep.

19. Press (Search), MAX, (Marker), ΔMODE MENU, FIXED ΔMKR to place the delta reference marker on the peak of the carrier (reference level of the amplitude fidelity).

20. Set the step attenuator to the first setting 10 dB in the second column of Table 2-15.

Table 2-15. Amplitude Fidelity Test Settings 2

dB from Reference Level	Step Attenuator
−10 dB	10 dB
−20 dB	20 dB
−30 dB	30 dB
−40 dB	40 dB
−50 dB	50 dB

21. Perform the following steps to measure the amplitude fidelity.

    a. Press (Trigger), SINGLE to make a sweep. Wait for the completion of the sweep.

    b. Press (Search), MAX.

    c. Record the delta marker reading in the calculation sheet for the amplitude fidelity at an RBW of 1 MHz. Use the "HP 4396A Reading" column corresponding to the dB from reference level in the first column of Table 2-15.

22. Change the step attenuator setting in accordance with the second column of Table 2-15. Then perform step 21 for each setting.

23. Calculate the test results using the equations given in the calculation sheet. Record the test results in the performance test record.

Note

Connect the signal generator's 10 MHz frequency reference output to the HP 4396A EXT REF Input on the rear panel as shown in Figure 2-21. With this configuration, both the signal generator and the HP 4396A are phase locked to the same reference frequency to obtain a stable measurement.

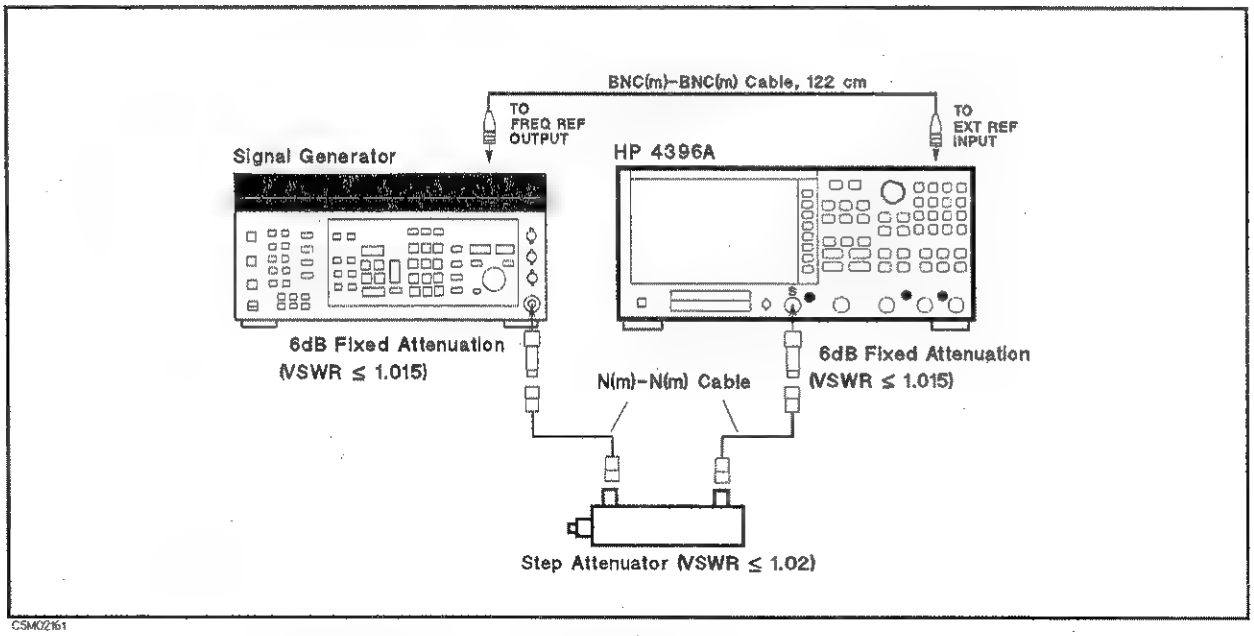

Figure 2-21. Input Attenuator Accuracy Test Setup

5. Press (Meas), ANALYZER TYPE, SPECTRUM ANALYZER, (Preset) to initialize the HP 4396A. Then set the controls as follows:

Control Settings	Key Strokes
Center Frequency: 50 MHz	(Center), (5), (0), (M/μ)
Frequency Span: 10 kHz	(Span), (1), (0), (k/m)
RBW: 1 kHz	(Bw/Avg), RES BW, (1), (k/m)
Scale/Division: 5 dB/Div	(Scale Ref), SCALE/DIV, (5), (x1)

6. Press (Scale Ref), REFERENCE VALUE, (-), (4), (0), (x1), (Scale Ref), ATTEN, (1), (0), (x1), to set the HP 4396A controls to the reference setting for the test.

7. Press (Trigger), SINGLE to make a sweep. Wait for the completion of the sweep.

8. Press (Search), MAX, (Marker), ΔMODE MENU, FIXED ΔMKR to place the delta reference marker on the peak of the carrier.

9. Set the HP 4396A controls as follows. This sets the input attenuator and reference level to the first settings listed in Table 2-16.

Control Settings	Key Strokes
Input Att.: 20 dB	(Scale Ref), ATTEN, (2), (0), (x1)
Reference Level: −30 dBm	(Scale Ref), REFERENCE VALUE, (-), (3), (0), (x1)

Table 2-17. RBW Accuracy Test Settings

HP 4396A	
RBW	**Frequency Span**
10 kHz	30 kHz
30 kHz	90 kHz
100 kHz	300 kHz
300 kHz	900 kHz
1 MHz	3 MHz
3 MHz	9 MHz

c. Perform the following steps to measure the RBW accuracy:

i. Press (Trigger), SINGLE to make a sweep. Wait for the completion of the sweep.

ii. Press (Search), MAX, (Marker), ΔMODE MENU, FIXED ΔMKR to place the delta marker reference at the peak of the carrier.

iii. Rotate the RPG knob to move the delta marker to lower frequency points until the delta marker reads −3 dB ± 0.1 dB.

iv. Press (Marker), ΔMODE MENU, FIXED ΔMKR to place the delta marker reference at the lower 3 dB frequency.

v. Rotate the RPG knob to move the delta marker to higher frequency points beyond the peak of the signal until the delta marker reads 0 dB ± 0.1 dB.

vi. Record the delta marker frequency reading in the performance test record ("Test Result" column for the resolution bandwidth accuracy).

d. Change the HP 4396A RBW and frequency span settings in accordance with Table 2-17, and repeat step 4-c for each setting.

5. **—Resolution Bandwidth Selectivity Test—**

a. Copy the test results of the RBW accuracy to the calculation sheet ("3dB Bandwidth" column for the RBW selectivity).

b. Set the HP 4396A controls as follows.

Control Settings	**Key Strokes**
Scale/Division: 10 dB/Div	(Scale Ref), SCALE/DIV, (1), (0), (x1)
VBW: 10 kHz	(Bw/Avg), VIDEO BW, (1), (0), (k/m)

c. Set the HP 4396A controls as follows. This sets the RBW, span, and input attenuator settings to the first settings listed in Table 2-18.

Control Settings	**Key Strokes**
RBW: 10 kHz	(Bw/Avg), RES BW, (1), (0), (k/m)
Frequency Span: 200 kHz	(Span), (2), (0), (0), (k/m)
Input Att.: 10 dB	(Scale Ref), ATTEN, (1), (0), (x1)

Table 2-18. RBW Selectivity Test Settings

HP 4396A		
RBW	**Frequency Span**	**Input Attenuator**
10 kHz	200 kHz	10 dB
30 kHz	600 kHz	10 dB
100 kHz	2 MHz	10 dB
300 kHz	6 MHz	10 dB
1 MHz	20 MHz	0 dB
3 MHz	30 MHz	0 dB

d. Perform the following steps to measure the RBW selectivity.

i. Press (Trigger), SINGLE to make a sweep. Wait for the completion of the sweep.

ii. Press (Search), MAX, (Marker), ΔMODE MENU, FIXED ΔMKR to place the delta marker reference at the peak of the carrier.

iii. Rotate the RPG knob to move the delta marker to lower frequency points until the delta marker reads between −60 dB and −60.8 dB.

iv. Press (Marker), ΔMODE MENU, FIXED ΔMKR to place the delta marker reference at the lower 60 dB frequency.

v. Rotate the RPG knob to move the delta marker to higher frequency points beyond the peak frequency until the delta marker reads between 0 dB and −0.8 dB.

vi. Record the delta marker frequency in the calculation sheet ("60 dB Bandwidth" column for the RBW selectivity).

e. Change the RBW, the frequency span, and the input attenuator in accordance with Table 2-18. Repeat step 5-d for each setting.

f. Calculate the test results for the RBW selectivity using the equation given in the calculation sheet. Record the test results in the performance test record.

2. Press (Meas), ANALYZER TYPE, SPECTRUM ANALYZER, (Preset) to initialize the HP 4396A.

3. Initialize the signal generator. Then set the controls as follows.

Controls	Settings
Amplitude	−20 dBm

4. On the signal generator, set the frequency to 23.92375 MHz (the first column of Table 2-25).

Table 2-25. Other Spurious Test Settings

Signal Generator Frequency	HP 4396A				
	Center Frequency	Frequency Span	RBW	VBW	Spurious Frequency
23.92375 MHz	23.92075 MHz	5.99 kHz	30 Hz	10 Hz	23.92075 MHz
99.9985 MHz	100 MHz	9.99 kHz	100 Hz	10 Hz	100.0045 MHz
99.9924 MHz	100 MHz	9.99 kHz	100 Hz	10 Hz	100.0048 MHz
100 MHz	110.71 MHz	9.99 kHz	100 Hz	10 Hz	110.71 MHz
100 MHz	142.84 MHz	9.99 kHz	100 Hz	10 Hz	142.84 MHz
1155.786429 MHz	1155.6734286 MHz	9.99 kHz	100 Hz	30 Hz	1155.6734286 MHz
1723.92375 MHz	1723.92075 MHz	5.99 kHz	30 Hz	10 Hz	1723.92075 MHz

5. On the HP 4396A, perform the following steps to measure the spurious level. In each step, the carrier level is measured first. Then the spurious level is measured.

   a. Set the controls as follows to measure the carries level:

Control Settings	Key Strokes
Center Frequency: 23.92375 MHz	(Center), (2), (3), (.), (9), (2), (3), (7), (5), (M/μ)
Frequency Span: 1 MHz	(Span), (1), (M/μ)
RBW: 3 kHz	(Bw/Avg), RES BW, (3), (k/m)

   The center frequency is set to the frequency of the signal generator.

   b. Press (Trigger), SINGLE to make a sweep. Wait for the completion of the sweep.

   c. Press (Search), MAX, (Marker), ΔMODE MENU, FIXED ΔMKR to place the delta marker reference at the peak of the carrier.

   d. Set the following controls to the settings listed in Table 2-25 (from the second to the fifth columns):

Control Settings	Key Strokes
Center Frequency: 23.92075 MHz	(Center), (2), (3), (.), (9), (2), (0), (7), (5), (M/μ)
Frequency Span: 5.99 kHz	(Span), (5), (.), (9), (9), (k/m)
RBW: 30 Hz	(Bw/Avg), RES BW, (3), (0), (x1)
VBW: 10 Hz	(Bw/Avg), VIDEO BW, (1), (0), (x1)

   e. Press (Trigger), SINGLE to make a sweep. Wait for the completion of the sweep.

   f. Press (Marker), ΔMODE MENU, ΔMKR SWP PARAM, (2), (3), (.), (9), (2), (0), (7), (5), (M/μ) to move the delta reference marker to the spurious frequency in the sixth column of Table 2-25.

   g. Press (Marker), (0), (x1), to move the delta marker to the spurious frequency.

   h. Record the HP 4396A marker reading in the performance test record ("Test Result" column).

6. Repeat steps 4 and 5 for each setting in Table 2-25.

24. RESIDUAL RESPONSE TEST (SA)

Description

This test connects a 50 Ω terminator to the HP 4396A's S input and measures the HP 4396A residual response at several frequencies where the response is most likely to be observed.

The residual response is any internally generated by mixing the harmonics of the first/second local phase-lock-loop oscillators and the related reference signal.

Specification

Residual response

@≥3 MHz, 0 dB attenuator ..... <−100 dBm

@1 kHz ≤ frequency < 3 MHz, 0 dB attenuator ..... <−90 dBm

Test Equipment

50Ω termination, type-N(m) ..... HP 909C Opt 012 or part of HP 85032B

Procedure

1. Connect the test equipment as shown in Figure 2-32.

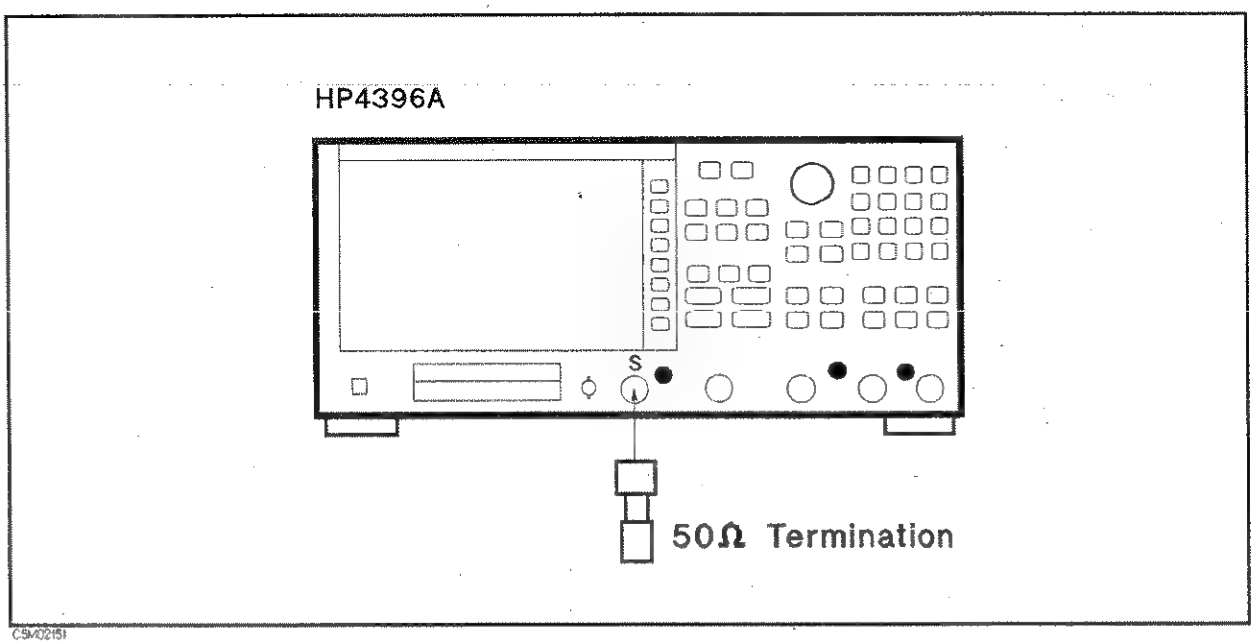

Figure 2-32. Residual Response Test Setup

9. ABSOLUTE AMPLITUDE ACCURACY TEST

Input R

Frequency	Mimimum Limit	Test Result	Maximum Limit	Measurement Uncertainty
100 kHz	−1.5 dB	_____	1.5 dB	±0.22 dB
1 MHz	−1.5 dB	_____	1.5 dB	±0.18 dB
10 MHz	−1.5 dB	_____	1.5 dB	±0.17 dB
50 MHz	−1.5 dB	_____	1.5 dB	±0.17 dB
100 MHz	−1.5 dB	_____	1.5 dB	±0.18 dB
1 GHz	−1.5 dB	_____	1.5 dB	±0.18 dB
1.79 GHz	−1.5 dB	_____	1.5 dB	±0.18 dB
1.8 GHz	−1.5 dB	_____	1.5 dB	±0.18 dB

Input A

Frequency	Mimimum Limit	Test Result	Maximum Limit	Measurement Uncertainty
100 kHz	−1.5 dB	_____	1.5 dB	±0.22 dB
1 MHz	−1.5 dB	_____	1.5 dB	±0.18 dB
10 MHz	−1.5 dB	_____	1.5 dB	±0.17 dB
50 MHz	−1.5 dB	_____	1.5 dB	±0.17 dB
100 MHz	−1.5 dB	_____	1.5 dB	±0.18 dB
1 GHz	−1.5 dB	_____	1.5 dB	±0.18 dB
1.79 GHz	−1.5 dB	_____	1.5 dB	±0.18 dB
1.8 GHz	−1.5 dB	_____	1.5 dB	±0.18 dB

Input B

Frequency	Mimimum Limit	Test Result	Maximum Limit	Measurement Uncertainty
100 kHz	−1.5 dB	_____	1.5 dB	±0.22 dB
1 MHz	−1.5 dB	_____	1.5 dB	±0.18 dB
10 MHz	−1.5 dB	_____	1.5 dB	±0.17 dB
50 MHz	−1.5 dB	_____	1.5 dB	±0.17 dB
100 MHz	−1.5 dB	_____	1.5 dB	±0.18 dB
1 GHz	−1.5 dB	_____	1.5 dB	±0.18 dB
1.79 GHz	−1.5 dB	_____	1.5 dB	±0.18 dB
1.8 GHz	−1.5 dB	_____	1.5 dB	±0.18 dB

11. MAGNITUDE RATIO/PHASE FREQUENCY RESPONSE TEST

A/R Measurement

Frequency	Measurement	Minimum Limit	Test Result	Maximum Limit	Measurement Uncertainty
100 kHz to 1 MHz	Magnitude Ratio	−1 dB	_____	1 dB	±0.105 dB
	Phase	−6°	_____	6°	±0.69°
1 MHz to 1.8 GHz	Magnitude Ratio	−0.5 dB	_____	0.5 dB	±0.042 dB
	Phase	−3°	_____	3°	±0.29°

B/R Measurement

Frequency	Measurement	Minimum Limit	Test Result	Maximum Limit	Measurement Uncertainty
100 kHz to 1 MHz	Magnitude Ratio	−1 dB	_____	1 dB	±0.105 dB
	Phase	−6°	_____	6°	±0.69°
1 MHz to 1.8 GHz	Magnitude Ratio	−0.5 dB	_____	0.5 dB	±0.042 dB
	Phase	−3°	_____	3°	±0.29°

12. CALIBRATOR AMPLITUDE ACCURACY TEST

Minimum Limit	Test Result	Maximum Limit	Measurement Uncertainty
−19.6 dBm	_____	−20.4 dBm	±0.082 dB

17. RESOLUTION BANDWIDTH SWITCHING UNCERTAINTY TEST

RBW	Minimum Limit	Test Result	Maximum Limit
3 kHz	−0.5 dB	_____	0.5 dB
30 kHz	−0.5 dB	_____	0.5 dB
100 kHz	−0.5 dB	_____	0.5 dB
300 kHz	−0.5 dB	_____	0.5 dB
1 MHz	−0.5 dB	_____	0.5 dB
3 MHz	−0.5 dB	_____	0.5 dB

18. IF GAIN SWITCHING UNCERTAINTY TEST

Reference Level	Minimum Limit	Test Result	Maximum Limit	Measuement Uncertainty
0 dBm	−0.3 dB	_____	0.3 dB	±0.032 dB
−2 dBm	−0.3 dB	_____	0.3 dB	±0.030 dB
−4 dBm	−0.3 dB	_____	0.3 dB	±0.028 dB
−6 dBm	−0.3 dB	_____	0.3 dB	±0.027 dB
−8 dBm	−0.3 dB	_____	0.3 dB	±0.027 dB
−12 dBm	−0.3 dB	_____	0.3 dB	±0.028 dB
−14 dBm	−0.3 dB	_____	0.3 dB	±0.027 dB
−16 dBm	−0.3 dB	_____	0.3 dB	±0.026 dB
−18 dBm	−0.3 dB	_____	0.3 dB	±0.026 dB
−20 dBm	−0.3 dB	_____	0.3 dB	±0.026 dB
−30 dBm	−0.3 dB	_____	0.3 dB	±0.027 dB
−40 dBm	−0.3 dB	_____	0.3 dB	±0.030 dB

19. NOISE SIDEBANDS TEST

Frequency	Offset from Carrier	Test Result	Test Limit	Measurement Uncertainty
39 MHz	−1 kHz	_____	< −95 dBc/Hz	±0.44 dB
	1 kHz	_____	< −95 dBc/Hz	±0.44 dB
10 MHz	−10 kHz	_____	< −105 dBc/Hz	±1.30 dB
	10 kHz	_____	< −105 dBc/Hz	±1.30 dB
	−1 MHz	_____	< −110 dBc/Hz	±1.30 dB
	1 MHz	_____	< −110 dBc/Hz	±1.30 dB
100 MHz	−10 kHz	_____	< −105 dBc/Hz	±1.30 dB
	10 kHz	_____	< −105 dBc/Hz	±1.30 dB
	−1 MHz	_____	< −110 dBc/Hz	±1.30 dB
	1 MHz	_____	< −110 dBc/Hz	±1.30 dB
1 GHz	−10 kHz	_____	< −105 dBc/Hz	±1.30 dB
	10 kHz	_____	< −105 dBc/Hz	±1.30 dB
	−1 MHz	_____	< −110 dBc/Hz	±1.30 dB
	1 MHz	_____	< −110 dBc/Hz	±1.30 dB
1.8 GHz	−10 kHz	_____	< −99.9 dBc/Hz	±0.44 dB
	10 kHz	_____	< −99.9 dBc/Hz	±0.44 dB
	−1 MHz	_____	< −104.9 dBc/Hz	±1.30 dB
	1 MHz	_____	< −104.9 dBc/Hz	±1.30 dB

20. FREQUENCY RESPONSE TEST

Frequency	Minimum Limit	Test Result	Test Limit	Measurement Uncertainty
10 Hz	−1.5 dB	_____	1.5 dB	±0.21 dB
100 Hz	−1.5 dB	_____	1.5 dB	±0.21 dB
1 kHz	−1.5 dB	_____	1.5 dB	±0.21 dB
10 kHz	−1.5 dB	_____	1.5 dB	±0.21 dB
100 kHz	−1.5 dB	_____	1.5 dB	±0.102 dB
1 MHz	−1.5 dB	_____	1.5 dB	±0.089 dB
6 MHz	−1.5 dB	_____	1.5 dB	±0.090 dB
10 MHz	−0.5 dB	_____	0.5 dB	±0.090 dB
50 MHz	−0.5 dB	_____	0.5 dB	±0.093 dB
100 MHz	−0.5 dB	_____	0.5 dB	±0.107 dB
1 GHz	−0.5 dB	_____	0.5 dB	±0.101 dB
1.79 GHz	−0.5 dB	_____	0.5 dB	±0.101 dB
1.8 GHz	−0.5 dB	_____	0.5 dB	±0.101 dB

21. SECOND HARMONIC DISTORTION TEST

Test Result	Test Limit	Measurement Uncertainty
_____	< −70 dBc	±1.47 dB

22. THIRD ORDER INTERMODULATION DISTORTION TEST

Frequency	Test Result	Test Limit	Measurement Uncertainty
1 MHz	_____	< −65 dBc	±0.7 dB
10 MHz	_____	< −75 dBc	±3.7 dB
500 MHz	_____	< −75 dBc	±3.7 dB
1.8 GHz	_____	< −75 dBc	±3.8 dB

23. OTHER SPURIOUS TEST

Spurious Frequency	Test Result	Test Limit	Measurement Uncertainty
23.92075 MHz	_____	< −70 dBc	±0.40 dB
100.0045 MHz	_____	< −70 dBc	±0.40 dB
100.0048 MHz	_____	< −70 dBc	±0.40 dB
110.71 MHz	_____	< −70 dBc	±0.40 dB
142.84 MHz	_____	< −70 dBc	±0.40 dB
1155.6734286 MHz	_____	< −70 dBc	±0.40 dB
1723.92075 MHz	_____	< −70 dBc	±0.40 dB
1749 MHz	_____	< −70 dBc	±0.61 dB
1798.995 MHz	_____	< −70 dBc	±0.40 dB
1799.9945 MHz	_____	< −70 dBc	±0.40 dB

24. RESIDUAL RESPONSE TEST

Frequency	Test Result	Test Limit
10.71 MHz	_____	< −100 dBm
17.24 MHz	_____	< −100 dBm
40 MHz	_____	< −100 dBm
42.84 MHz	_____	< −100 dBm
630 MHz	_____	< −100 dBm
686.19333333333 MHz	_____	< −100 dBm
1064.99 MHz	_____	< −100 dBm
1352.9683333333 MHz	_____	< −100 dBm
1387.278 MHz	_____	< −100 dBm
1586.775 MHz	_____	< −100 dBm